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Electro-Therapy.

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PART I

As in human practice, so also in general veterinary practice there has accumulated a fair amount of proof of the value of electro-therapy in selected cases. Its chief application will be found in canine practice, but its successful use demands time, patience and knowledge.

That medical electricity may sometimes have failed, prompts one to ask the reason why. Was the case suitable for electrical treatment? What electrical knowledge had the surgeon? Was the apparatus used, and the mode of its application, such as to ensure success? Was the diagnosis correct and was it followed by the most appropriate treatment? If all these questions could be answered in the affirmative one might hazard a guess that not more than 10 per cent. of failures would be experienced.

As an instance of the necessity for correct diagnosis followed by appropriate treatment, one may cite a case in which a quack prescribed faradism for the cure of paraplegia, not knowing that the cause of the condition was a dislocation of the dorsal vertebrae with continuous pressure exerted upon the spinal cord.

The canine practitioner will find practically all his needs will be met if he has apparatus and knowledge enabling him to apply galvanism, ionisation, faradism, high-potential current, electrically produced actinic and heat rays.

From the standpoint of the general practitioner, electro-therapy and light-therapy open up many new vistas in medicine and surgery, and although not entirely replacing some of the simple methods of application of heat, massage and exercise, enable a well-controlled and more extended application of physical energies. With comparatively simple and inexpensive equipment, the general practitioner can produce results in many conditions in which treatment by medication and surgery alone is not quite satisfactory. The average physician, no better in this respect than the average layman, looks upon electrical apparatus either as something mysterious, ready to perform curative feats by the turn of a knob, or else thinks it is all make-believe.

As a matter of fact, all that apparatus can do is to deliver a definite form and amount of physical energy to a given part of the body. It is for the physician to know what physiological effects to expect from such an application and when to make use of it in treating disease or injury. The results of electrical treatment are not due to magic, but to the scientific application of known physical principles. To-day every general hospital, not only in England, but throughout the world, uses some form of electrical treatment.

HOW ELECTRICITY ACTS UPON THE BODY

(1) *Thermal Effects.*—All electrical currents cause a rise of temperature in a conductor, due to conversion of electricity into heat. The heat produced is directly proportional to the square of the current strength, and that produced in different conductors is directly proportional to the resistance of each conductor. The tissues of the body possess a varying resistance, and those of higher resistance should heat up more when traversed by the electrical current. The latter, however, will not pass along a high resistance if there is a parallel path of lower resistance available.

(2) *Electro-Magnetic Effects.*—The electron theory explains electro-magnetic phenomena by picturing magnetism itself as due to the movement of electrons within the atom. In most electro-therapeutic apparatus the principle of current production is inevitably linked up with electro-magnetic induction.

(3) *Chemical Effects.*—Solutions of acids, bases or salts, known as electrolytes, dissociate into free atoms or groups of atoms. These free atoms all bear an electrical charge. Bases, metals and alkaloids are electro-positive, acids and acid radicals being electro-negative. These electrified particles have been named ions or wanderers. When a direct electrical current is applied to an electrolytic solution, the ions begin to wander; those with a positive charge are attracted toward the negative pole or cathode, and those with a negative charge toward the anode or positive pole. The process of dissociation is known as *ionisation.*

Galvanism

The galvanic (direct or uninterrupted) current is derived from dry cells, accumulators, or from the main (if the current is "direct"), the first of these being the best for ordinary work. When mains current is used a resistance board must be employed to reduce the voltage down to that applicable in medicine, *i.e.*, 50 to 60 volts.

A milliamperemeter, and a rheostat or other means of gradually increasing the current, are also essential. This is almost universally incorporated in any modern galvanic battery one may purchase for therapeutical purposes. With such a set one not only may apply a galvanic current for suitable cases, but has the whole field of ionic medication at his service. [See Kirk's "Index of Treatment" (1948), Fig. 114]

In using this apparatus one attaches an electrode to the wire leading from the negative terminal, and another to the wire from the positive terminal. These electrodes are merely applicators of various sizes and shapes, made usually of thin metal (lead or zinc) plates amply covered with flannel over cotton wool. The current flows normally from positive pole to negative, so that in order to pass an electric current through the body or limb of a dog, the positive electrode is applied to that part of the body we wish to treat. The indifferent or negative electrode, used to complete the circuit, is applied to some other convenient part of the body or limb.

Any electrode applied to a body surface must be (*a*) thoroughly covered by about three layers of flannel or chamois leather over a pad of cotton wool, in order to prevent any part of the metal from touching the skin and so producing a burn; (*b*) in close and even contact with the skin, any lint coverings being smooth and without wrinkles. If a bony prominence is under the electrode, care must be taken that the pressure over it is not greater than over adjacent parts as otherwise a burn may be occasioned. The electrode might with advantage be bandaged into position, preferably with a rubber bandage; (*c*) wet with saline solution, though not dripping wet. The skin should have been clipped and wetted because the less the resistance of the tissues the less density of current will be required to provide a safe therapeutic effect.

The skin where the electrodes are to be applied should be inspected for small wounds or sores, and if one is discovered, it should be protected with a small piece of rubber plaster to prevent the current entering at that less-resistant spot.

The application of a galvanic current is not a painful process unless one neglects the fundamentals above enumerated, or employs too great a density of current, or for too long. The steadily flowing galvanic current causes no muscular contraction except when the flow of current is *suddenly* started or broken at sufficient strength.

DENSITY OF CURRENT.—The most important factor in the action of a current on a given area is the *density* of the current. A given amount of current passing through a large area may exert no appreciable effect, but when concentrated in a conductor of small diameter, as, for instance, in the skin under a small electrode, it may produce a very marked effect, amounting even to destruction of tissue.

There is no known measure of density; the number of milliamperes flowing through an electrode does not furnish a measure of density but if the size of this electrode is known then the number of milliamperes per square inch will give an accurate measure of the density underneath. The density of a current may be increased by (1) increasing the amount of current, or (2) decreasing the size of the electrode.

DOSAGE.—Under physiological conditions the comfortable toleration of the patient is the principal guide of safe current density. Dogs will, of course, fidget merely from being held, but if one notes that the discomfiture disappears when one deliberately decreases the current, it will be obvious that treatment is too intensive. In judging the sensitivity of patients, their temperaments as well as the location of electrodes must be taken into consideration.

It is a good rule to use two electrodes of equal size, and for each to be of ample rather than meagre proportions. As an average, the normal skin will tolerate about ½ to 1 milliampere of galvanic current per square inch of electrode surface. The smaller the electrodes the greater current density, and the less current can be applied. It should take two to four minutes to reach the maximum current

strength and to allow for gradual overcoming of skin resistance, avoiding stimulation of sensory reflexes. As the treatment goes on, skin resistance decreases and the meter reading shows a slight decrease. At the same time the sensitiveness of superficial nerve also decreases and the rheostat can now be further advanced because of better toleration of the current.

In all cases the current should be turned on only when the maximum amount of resistance offered by the rheostat is in circuit, *i.e.*, at "weak." This resistance should then be gradually and slowly reduced until the current flowing through the dog (as ascertained from the milliamperemeter) reaches the desired amount. When the current has acted for the required time, it should be reduced gradually and slowly, then turned off. For small areas it is found that patients will not tolerate more than a few milliamperes.

The minimum current that will be of value is about 3 ma. for twelve minutes. For large surfaces, such as the lumbar muscles, 10 to 20 ma. might be tolerated by the majority for about 20 minutes daily. At the same time it is well to remember that a greater therapeutic effect will follow long application of weak current than short application of a strong one. Late investigators emphasise that the alleged ineffectiveness of galvanic treatment was mainly caused by too little current being applied for *too short* a period. Treatments may be repeated daily or every other dav.

Conditions Treated by Galvanism.—The therapeutic effect of this current is dependent upon the chemical and physiological changes it produces in the tissues; and an even flow of electrons is accompanied by a general movement of ions similar to that which takes place in an aqueous salt solution. Vasomotor stimulation of the skin and increased circulation and nutrition occur in the tissues lying in the path of the current. This speeds up the resolution of inflammatory processes; reflex stimulation or relief of pressure relieves pain. Selected cases of acute and chronic inflammatory conditions—especially fibrotic thickening—and circulatory disturbances have been successfully treated. Some other very important conditions are treated by ionisation.

PART II

Ionisation

Ionisation is applied by means of a galvanic current, and consists of utilising ionic movement for the introduction into the body of the ions of certain drugs or chemicals, not only metals such as zinc and copper, but also sedatives such as quinine or the salicylate ion of sodium salicylate.

Such ionic medication is generally used for local conditions, but it may also have a general effect *via* the blood stream, the effect depending upon whether the ion has, or has not, an affinity for the skin.

Iodine introduced in this way has been found, in a few minutes, in the saliva and urine. Thus it is seen that drugs penetrate far more deeply into the tissues by this method than they otherwise would, and so exert their healing action and attack the germs of disease lurking beneath the surface.

The electro-chemical influence of this current on the tissues may be either of a stimulating or of a sedative nature, the effect on pain being especially important in the treatment of neuralgia, neuritis, sciatica, etc. Its influence is felt throughout its whole path as it sweeps through the tissues, penetrating every single cell of the injured or inflamed nerve down to its finest branches.

Since the tissues of the animal body have in their composition water with various salts in solution—chlorides, phosphates, sulphates, etc.—partly split up into their respective ions, it follows that if a continuous current is passed through the body there will be a movement of ions. The direction of their movement, however, varies according to the salts being used.

Electro-Positive Drugs.—This aspect is very important indeed for, whereas salicylates, iodine and chlorine enter by the negative electrode, cocaine, quinine and the metals enter by the positive electrode. On entering the body some ions may unite with those of the tissues to form soluble compounds which are carried by lymph and blood to distant parts of the body. This occurs with salicylates, iodine and strychnine, etc.

The ions of the heavy metals exert a local germicidal effect, and also a coagulation of tissue protein in proportion to the strength and the flow of the current from the positive pole.

In contrast to superficial action of the usual caustics, copper and zinc ion-transfer extends deeper into the recesses of the mucous membrane and, accordingly, these caustic ions have been found clinically effective for treatment of infected granulation tissue, for mild cauterisation of mucous membranes, for stimulation of indolent ulcers and for sterilisation of infected sinuses.

Copper may be used for the treatment of endocervicitis through a plain copper electrode; and also as a solution of copper sulphate for the treatment of sluggish wounds and ulcers, and for fungus infections of the skin.

Zinc ions are much used in the treatment of septic conditions, and the use of a solution of zinc sulphate or zinc chloride for sinuses, fistulae, ulcers, septic wounds and otorrhoea, is strongly recommended. A good solution is:

Zinci sulph.	grs. lxxv
Glycerini	℥ ij
Aqua	℥ xxxv

Dilute this stock solution with an equal part of warm water just before use.

It has been recognised that ionisation exerts a marked "lytic" action as exemplified by its effects in anchylosis; in neuralgic pain due to compression of a nerve in an exudate or in a cicatrix; and in the treatment of large scars in muscle and among tendons interfering with movement, by solution and resorption of exudates and their products.

Those who work among racehorses may do worse than to test this out. The chronic lameness which occasionally follows toe amputation in racing greyhounds is another condition which yields to this treatment.

The pain and stiffness in joints following sprains, due very often to slight adhesions, and the pain due to inflammation of the synovial sheaths of tendons, have yielded in a remarkable manner to ionisation with sodium salicylate or chloride.

It need hardly be stated here that treatment of the pain does not exclude the necessity for making a diagnosis as to the cause and nature of the complaint, and does not preclude the employment of remedies to remove the cause and aid in the restoration to normal.

The ion of zinc is an antiseptic of the first rank, and there is no wound or ulcer which cannot be disinfected by its use provided its surface can be reached by the electrodes. One of its peculiarities is that it provokes but little inflammatory reaction. The action of zinc ions on albumin is made use of in practice to kill micro-organisms in tissues, or in the discharge present on the surface of tissues.

Clinical observation has shown that by ionisation with zinc it is possible to bring about a rapid and complete subsidence of suppuration in acute abscesses, maxillary sinus disease, long suppurating tracts of the soft tissues, middle ear inflammation (in human beings) and various other septic conditions of the body.

Ionisation is essentially a local treatment and therefore it should be applied to the *whole* of the affected area. It does not do to ionise nine-tenths of an infected wound and leave one-tenth to reinfect the rest. The possibility or otherwise of treating the whole area is the main indication as to the suitability or not of this method of treatment in any particular case in which, from the nature of the disease, experience of similar cases has shown that this form of treatment is suitable.

Electro-Negative Agents.—Chlorine, iodine and salicylic acid are electro-negative. In the standard technique of galvanism, in which moist pads are soaked with salt solution, chlorine ions are always liberated under the negative pad, and at the same time sodium hydroxide is formed. The latter is slightly caustic, and after a prolonged application it often will soften superficial scars; it may also affect denser scars and make them more amenable to subsequent stretching and massage.

Iodine ionisation has been recommended for simple hypertrophic goitre and for peripheral facial paralysis. A 1 to 2 per cent. solution of sodium or potassium iodide is used, and treatment should last about 20 minutes. A 2 per cent. solution of sodium salicylate is recommended for all rheumatic conditions.

Dangers of Galvanism.—The chief ill effect is the possible production of skin burns, which always is due to excessive density of current. To some extent one may be guided as to what is occurring by the discomfiture of the patient; but the safest guide is to keep the current strength always in relation to the size of electrodes (see below). Burns may be caused by touching the skin with the naked metal, or by insufficient padding of electrodes. Always turn the current off before making any readjustment of electrodes, and see that the latter are firmly and evenly applied, well padded, sufficiently moist, and that no prominences are receiving undue pressure and therefore current.

Sinusoidal Current.—A modified galvanic current known as the surging or undulating current is much employed by medical men for paralysis.

If a galvanic current is passed through a rhythmically varying resistance which at the same time periodically reverses the direction of flow, a reversing galvanic wave or slow sinusoidal current is produced.

Five to 30 periods in a minute is the usual rate at which the galvanic sinusoidal current is employed. It has been established by both clinical and experimental evidence that this type of current furnishes a stimulus of long duration and slowly surging quality. Smooth muscles and skeletal muscles in the stage of flaccid paralysis respond to such a stimulus, while they cannot be stimulated by the normal quick forms of electrical stimulation.

This type of current will be discussed again under the heading of paraplegia.

Faradism

Faradic Current.—This is an induced current of an alternating nature, that is to say, one in which the flow is being continually reversed in direction at short intervals about 100 times a second. It is chiefly employed in electro-diagnosis for muscle testing; it is not suitable without gradual surging for electric muscle exercise because of its painful tetanizing effect.

One's aim with faradic current is to obtain muscular contractions of maximum strength with a minimum of sensation. Pushed to excess this current can produce quite disagreeable sensations; even tetany. Thus, for use on animals, one has to be cautious and kindly.

Successful results do not depend upon production of unbearable sensation; and one need only increase the strength of the current sufficient to cause the patient to be slightly uneasy. The author turns to this current in cases of wasted muscles, completely paralysed flaccid muscles and stiff joints.

In the former case the wetted electrodes are affixed in such position that the current flowing between them will traverse the whole of the affected muscle.

For hemiplegia one electrode is placed on the opposite side of the head and the other at the croup; whilst for paraplegia one electrode is fixed between the shoulder blades and the other is in a bowl of water in which both hind feet of the patient are also immersed.

Usually not more than ten minutes' treatment with a gentle current is given daily, and it is surprising how inert muscles soon begin to show a little kick or reaction to the stimulus applied.

In practice, the only way to gauge the dosage of the faradic current is according to the sensation of the patient and the strength of muscular contractions produced. The aim is just to maintain tone and not to tire the muscle with violent contractions. A current which causes any painful sensation is much too strong and may do harm. The current should be tried first on the operator himself and then on the sound muscles of the patient before being applied to the paralysed muscles. After switching on, the current is increased only very gradually until a point is reached at which the dog just shows some uneasiness.

There is no electrolytic effect in faradism and burns are not caused by excess current. The amount of current passing is not recorded on the milliamperemeter.

PART III

Electro-Diagnosis

Low-frequency currents, which have been discussed in parts I and II of this article, have two main uses: (*a*) they furnish a means of electrical diagnosis for the recognition of pathological conditions of the motor tract, and (*b*) they furnish means for the stimulation of weak or paralysed muscles, a form of electrical muscle exercise valuable in the treatment of injuries and diseases.

Electro-diagnosis deals with the reaction of muscles and motor nerves to electrical stimuli, and affords a valuable aid from the standpoint of diagnosis and prognosis in pathological conditions of the motor tract—including the brain, spinal cord, peripheral nerves and also the muscles.

Every practitioner, when confronted with animals suffering from lesions of the central or peripheral nervous system, should be able to carry out an electro-diagnostic examination. One may suspect that the loss of voluntary power in a limb is only functional, but a brief examination of the muscles by faradic current will definitely prove—if the muscles contract—that this is the case, and if no contraction is elicited, that there is an organic nerve lesion.

Each skeletal muscle possesses the property of independent irritability and contractility if artificial stimuli are directly applied to it. Similarly any nerve may be stimulated at any point of its course; and the most sure and convenient method of stimulation is by electricity.

The various pathological conditions of the central and peripheral nervous systems are accompanied by typical changes in the electrical reaction. The latter may be normal, exaggerated, diminished or quite absent.

Normally, all muscle stimulation occurs through the more excitable nerve fibres, but when the latter have been damaged the muscle degenerates, and a quick stimulus (faradic current) does not produce response in either nerve or muscle. A longer and more powerful stimulus, however, will still bring about a response in the muscle. Lack of any response whatever indicates that there is neither conductive nerve tissue nor contractive muscle tissue present. This occurs only in the later stages of peripheral nerve injuries, in poliomyelitis of man, or in progressive muscular atrophy.

Motor Points.—Strong electrical stimuli when applied indiscriminately to any part of the body will produce shock, fright or discomfort, but in electro-diagnosis a localised area is under test, a minimum of current is used and no pain occasioned. Every nerve and muscle, unless deeply covered by other muscles, possesses a small area where it is most easily excited and where a visible contraction can be elicited with a minimal amount of stimulation. This is called the motor point, and is usually located about the middle of the muscle belly where the motor nerve enters the muscle. The motor point of a nerve will be in the position where it is nearest to the skin.

Apparatus.—An ideal apparatus for testing by faradic and galvanic currents is the one mentioned on page 441 although of course there are many varieties from which to choose. Accessories required are (1) an active or testing electrode consisting of a small metal disc covered with chamois or layers of gauze, and mounted on a handle with an interrupting device (make and break key). This electrode serves to concentrate the current over motor points, and allows for its make and break. For nerves and small muscles a $\frac{3}{4}$-inch disc is suitable; for larger areas one of $1\frac{1}{2}$ inches. (2) A dispersive electrode suitably covered and of much larger dimensions—say 2×4 or 3×5 inches.

Method.—Areas of the body over which electrodes are likely to be applied should be closely clipped in order to afford close contact between electrode and skin. The area to be examined should be warmed up by a heat lamp or a hot water swab, and the electrodes should be well moistened in hot salt water. The dispersing electrode is placed over any part of the body which has little muscular tissue such as the sternum or chest wall, and should be bandaged there to avoid loss of contact through wriggling. The testing electrode is placed directly over each motor point to be tested.

In the case of paraplegia, the hair should be removed all along the dorsum, and the skin wetted as before. Both hind legs are immersed up to the hocks in a bowl of warm salt water, into which is also placed the dispersive electrode.

The testing electrode is then applied at a point about the middle of the back. If there is *normal* response, it is moved one or more times a little further down until a spot is reached where reaction is dulled or non-existent. That spot will more than likely be the position of the causal lesion. Motor points may also be found in the thigh muscles, each thigh being tested in turn.

It will be found that some extra resistance of skin and muscles has to be overcome at first, in consequence of which more current is needed in the beginning; but after a contraction or two, less current will be necessary for a response. If, therefore, one commences with a current of only moderate strength, it can be decreased gradually until the minimum is ascertained which is just enough to occasion a response.

In some cases of paralysed muscle it is not easy to detect the response, and often all that can be felt is a slight contraction over the muscle tendon.

The Faradic Test.—Faradic current will occasion a tetanic contraction of the muscle or group of muscles which will persist so long as the current flows. The electrodes may be attached to either the negative or positive terminals. If normal faradic response is obtained, the necessity for testing by galvanism is obviated.

Galvanic Test.—The galvanic current applied to normal muscle or nerve does not occasion any stimulus whilst it flows steadily, but will cause a sharp contraction if it is suddenly started or interrupted, in a flow of sufficient strength.

In this test the dispersing electrode is connected to the positive and the testing electrode to the negative terminal of the set. Place both in their respective positions, advance the rheostat slowly, thus increasing the strength, then press the key (make and break) from time to time and watch for the first visible contraction. As the testing is being repeated, the needle of the milliamperemeter will swing out further and further with the same rheostat setting. This is due to the fact that the repeated passage of the current decreases skin resistance.

Reaction of Degeneration.—Quite the most important use of the faradic and galvanic tests is the detection or otherwise of what is known as "reaction of degeneration" (RD).

If, in consequence of disease or trauma, conduction of impulses through a peripheral nerve has ceased, either by gross anatomical or finer molecular disarrangement of the nerve trunk or the inferior roots, or by a lesion in the spinal cord, certain well-known changes in the electrical reaction (RD) occur within ten days. The anatomical changes consist of the breaking up of the affected nerve trunk and of atrophy and, later, fatty degeneration of the muscles supplied by it. The nerve loses its electrical conductivity, and the character of the muscular contraction alters. There is no muscular response to faradic stimulation and only a sluggish response to galvanism. The nerve does not respond to either. The motor point is displaced from its normal position, in the belly of the muscle, toward the periphery where the muscle fibres join the tendon. The importance of the RD lies in the fact that when present ten days after an injury or disease, it indicates changes in nerve and muscle substance that will take considerable time to heal and in probably 50 per cent. of cases may never recover.

Many forms of transition occur between partial and full reaction of degeneration; partial RD may develop into full RD. Functional paralysis and paralyses of cerebral origin are never accompanied by important disturbances of the electrical reactions. Therefore the absence of RD is good prognostic evidence. The presence of a full RD permits us to state that the seat of a lesion, accompanied by paralysis, is in the lower motor neuron, the inferior spinal roots or in the peripheral nerve. It denotes the severity of a lesion and the fact that it is an organic one. It has no relation whatever to the aetiology of the lesion, because trauma as well as inflammation and new growth can produce RD. It certainly indicates such changes in nerve and muscle substance as will take considerable time—probably months—for recovery. The existence of RD does not by any means indicate irreparable damage. When there is no RD, one may expect recovery in two or three weeks, but with partial RD present, recovery may take six to twelve weeks.

The value and necessity of making these tests cannot be denied, as one of the great problems attending a case of paraplegia is the prognosis. If we are helped only in that matter, the trouble and time taken will have been well worth while.

Reaction of degeneration, full or partial, may be found in the following conditions: lesions of the cord (*e.g.*, haematomyelia); compression of nerve trunks in spinal canal (pachymeningitis, tumours, fractures, dislocations, calcified discs); traumatic lesions of peripheral nerve trunks (compression, stretching, concussion); toxic neuritis (lead, diabetes, focal infections, viruses); infectious neuritis (tuberculosis, distemper, polyneuritis); neuritis from exposure; and, of course, in the human being, poliomyelitis. It has been stated by some investigators that the dog is not susceptible to the last-mentioned disease, but the author still feels that further investigation is called for.

PART IV

Paraplegia

Paraplegia has always been a problem to the canine practitioner, largely because its aetiology is so often unrevealed, and its treatment so very difficult and protracted. The average clinic, and probably quite a number of veterinary surgeons, often take the easy course and advise destruction. This is a pity, not only because of the great economic and sentimental losses entailed, but also in consequence of a certain loss of prestige to the qualified man who may not be able to do better than the quack in this respect. Admittedly the disease is most difficult to deal with, some of the difficulty arising possibly from a lack of pathological and clinical research. Electricity, for instance, is not by any means employed to the extent it deserves; and those who are inclined to deny its value are most likely the people who have not the time, the facilities or the patience to use it. The writer can affirm definitely that he has obtained frequent successes by electro-therapy, and of course it is common knowledge that hospitals and medical practitioners all over the world always resort to it and, indeed, would be held to be negligent not to do so.

During 1946 and 1947 there was a great increase in the number of cases of paraplegia. It was most distressing to have to destroy a large proportion of them, and this for three main reasons:—

(1) That many cases were accompanied by extreme hyperaesthesia, barking, whining, and even convulsions, which distressed the owners.

(2) That as treatment was likely to be long and somewhat expensive the owners could not or would not afford it.

(3) That recumbent dogs need a very great deal of hygienic treatment and nursing, and unless they are continually washed and dried, they become excoriated by the repeated dribbling of urine.

There seemed to be no ready explanation for this increase in the number of cases, but it was somewhat significant that it coincided with the advent of more cases of human infantile paralysis than had ever been known before. Not a few of the dog cases exhibited clinical symptoms resembling those manifested by a goodly proportion of human beings suffering from poliomyelitis. [This matter was discussed in the issue of *The Veterinary Record* of October 25th, 1947 (**59**. 574–5)].

The writer submitted a few carcases to pathological examination, and it seemed clear that the C.N.S. was being attacked by virus—one, the known distemper virus, and another, or several others, of unknown identity.

It is greatly to be hoped that when the time is ripe the Animal Health Trust will be prepared to accept paralysed dogs into its hospital for so long as the dogs can be kept alive, to establish how many weeks or months of unremitting treatment are needed to effect a cure. The nervous systems of animals dead of the disease need intensive histological and pathological investigation, to ascertain the predominant causes; and if possible to discover some mode of prophylaxis.

In not a few cases the paraplegia is of very sudden onset, does not follow or accompany distemper, may occur in middle-aged dogs, and in those who have enjoyed an active, conferred immunity from the age of three months. Often no visible lesion can be detected by radiographic examination.

As already stated under "electro-diagnosis" paraplegia may arise in consequence of spinal fracture or dislocation, myelitis, tumours, concussion, compression of the cord by new growth or extravasation, peripheral nerve injury, toxins, infections, calcified intervertebral discs, lesions of the bulbar nucleus and probably several other conditions. Therefore, before embarking upon any method of treatment, it would be very wise to make an historical and clinical investigation in order to establish a diagnosis. This may often be the easier arrived at by a process of elimination. Certainly electro-diagnosis would be very helpful, as upon the conclusions reached may depend the prognosis.

Cases of paraplegia have frequently been seen which, within two or three days, have completely recovered and it is very difficult to hazard an opinion as to the cause in such instances.

There are many methods of dealing with paraplegia, but in this article we are concerned almost entirely with electrical methods. These provide a very fair measure of success provided the cases upon which they are practised are appropriate for such treatment. Obviously, a paralysis arising from mechanical compression of the cord such as in fracture or dislocation of the spinal vertebrae, or intervertebral enchondrosis, would be unlikely to derive benefit from any line of treatment which failed first to remove the pressure from the cord. The same may be said in instances in which there has been a severance of a peripheral nerve.

On the other hand, paralysis arising from inflammation, effusion, concussion, haemorrhage, etc., might well clear up much earlier if, in the later stages, re-education of atrophied and weakened muscles were effected by electrical stimulation.

As a matter of fact, when a dog is first noticed to have lost the use of its legs, it is an excellent plan to adopt measures to guard against muscular atrophy. It is better, and probably easier, to prevent this than to make good a muscle loss, and preventive measures should be commenced very early, *i.e.*, at least within a week of onset of paralysis. Hand massage is useful or one may employ the electrical vibrator for three or four minutes twice a day. Another excellent method is the use of *weak* faradic, surging currents. Minimal doses only should be used—just sufficient to cause visible contractions. The aim is just to maintain tone and not to tire the muscle with violent contractions. A current which causes any painful sensation is much too strong and may do harm. Faradism, in fact, should not be employed in the painful stages.

Re-Education of Muscles is exceedingly important in the long-dragged-out paralytic stage. Any voluntary movement performed by the patient is of much greater value in recovery than the same movement performed passively by a masseur. Massage is not an adequate substitute for active exercises, and this is why a walking machine is sometimes so useful in re-educating the hind limbs.

The rhythmic contractions of muscle which are noticeably induced by the sinusoidal current must inevitably help in re-establishing sensory and motile power in quite a number of cases.

Muscles with an Intact Nerve Supply.—When muscles are atonic and wasted from any cause, and voluntary exercise is not feasible, so long as the nerve path is intact the production of painless graduated muscular exercise by electric stimulation reproduces the physical and chemical phenomena connected with normal muscular work. As a result, the restoration of muscles to their normal physiological activity takes place more rapidly, and all tissues in the neighbourhood are benefited by the increased activity produced by the muscle movements in the circulation of blood and lymph. Acting as an external stimulus to physiological circulatory changes, muscle action not only mechanically assists in prevention of blood and lymph stasis but also lessens the formation of adhesions—perhaps the most frequent cause of long-standing disability after even minor injuries.

In Denervated Muscles.—The main function of every striated muscle is to contract in response to voluntary impulses. A muscle with an injured nerve does not contract voluntarily or reflexly and, being unable to perform its natural function of contraction, tends to revert to non-contractile connective tissue type.

Since paralysed muscles are unable to do any active work, it seems self-evident to many clinicians that a method which enables muscles to maintain part of their contractility and their nutrition, is a desirable one. Electrical stimulation is the only known means for this purpose and its value is being attested by both clinical and experimental evidence.

Weak muscles with no organic nerve involvement respond best to a succession of very short stimuli, at a rate of 50 to 100 per second, sufficiently surged and spaced so as to allow gradual contraction and an intervening rest. This is known as graduated muscular stimulation. For this purpose surged forms of the faradic type of current and the interrupted and modulated forms of alternating current serve best.

The treatment of spastic muscles by electrical stimulation is much less satisfactory than that of flaccid types of paralysis. It should be considered at best only as an adjunct to muscle training and re-education.

Muscles in the Stage of Flaccid Paralysis respond only to a very slow rate of stimulation—10 to 20 per minute—and their contraction is sluggish and wormlike compared to the brisk contraction of normal muscles. A slow smooth stimulus such as the slow (galvanic) sinusoidal is the current of choice. It produces a stimulus of long duration and slowly surging quality to which the paralysed muscles respond gently and painlessly.

In myelitis, treatment calls for restoration of function. Weisenburg & Alpers* state that physical treatments in myelitis must be carried out over a prolonged period, and that it is surprising how persistence will be rewarded often by encouraging results.

In treating paraplegia, the writer usually employs a surging galvanic current. A large dispersive electrode is placed over the spinal column, well above the site of the lesion, and connected to the positive pole ; a smaller electrode, connected to the negative pole, is wrapped around each hind leg, just above the hocks. The general technique is followed as has been described on page 441. A commencing current of 2 to 3 ma. is turned on and should not occasion any discomfort. Later, it will be found that the milliamperage can be increased to perhaps 5, still without disagreeable effect. If such does occur, then the current is reduced. Fifteen to 20 minutes of this treatment daily should be enough, and as the days go on, one will generally notice a gradually increasing kick in the limbs. Considerable improvement should be noted in about a fortnight. The dog is encouraged to do active work with the affected muscle groups. Improvement will of course depend upon the extent of tissue damage.

Another way of applying the current is to stand both hind legs in a bowl of warm salt water. The legs, at the water's surface, may feel a tingling sensation which is minimised if they are first bandaged from the foot to the hock.

Classification of Low-Frequency Currents

Current	*Principal Use*
Interrupted galvanic	Electro-diagnosis Stimulation of denervated muscles
Faradic	Electro-diagnosis
Surging faradic ; and rapid sinusoidal	Stimulation of muscles with intact nerve supply
Galvanic sinusoidal	Stimulation of denervated muscles

* "Principles and Practice of Physical Therapy." Vol. I. Chap. 16. 1933.

RINDERPEST IMMUNISATION CAMPAIGN IN AFRICA

"Only recently has it become known," says the *African World*, "that in theearly days of the late war, even before hostilities began on the continent of Africa, a campaign of another kind was being conducted in Tanganyika, Northern Rhodesia and Nyasaland against a more formidable enemy than the Italian army—rinderpest, the dreaded cattle disease, which is highly infectious and so swift in action that infected animals often die within two days. The loss and the danger to food and milk supplies involved in the spread of the disease may be gauged from the extent of its ravages when it invaded Southern Africa 50 years ago and swept away 80 per cent. of the cattle population. Central Africa is the breeding ground of rinderpest and it is practically impossible to eliminate it altogether, but the veterinary authorities in Kenya, Tanganyika and Uganda do their best to check its spread by immunisation.

"Early in 1940 it was decided to carry out mass immunisation of all cattle in Southern Tanganyika and along the borders of Northern Rhodesia and Nyasaland, under the supervision of the South African Veterinary Research Institute at Onderstepoort, near Pretoria. There was no hesitation about adopting drastic measures. Enclosures and slaughterhouses were built, laboratories installed in farm buildings, and a virus injection was given to some thousands of cattle, which were slaughtered five days later and the spleen removed for the preparation of the necessary vaccine. Then followed the huge task of immunising all the remaining cattle in Southern Tanganyika by means of a triple inoculation. Part of the plan, to prevent infection being carried south by game, was the erection of a timber fence, eight feet high, across 250 miles of country between Lake Nyasa and Lake Tanganyika. This remained in use until 1946, but vigilance has not been relaxed. The scientists at Onderstepoort are supplied with monthly reports from Kenya and Tanganyika and are ready from prompt action if there is any further threat of the disease spreading southwards."

REVIEW

[Some Elements of Plants and Animals—The Mineral Elements in Plant and Animal Nutrition. By Frank Ewart Corrie, B.Sc., N.D.A., N.D.D. London: *Fertiliser Journal, Ltd.*, 100, Cannon Street, E.C.4. 1948. Price 8s. 6d. pp. 120+10+3 Appendices.]

This book is a general review of the existing knowledge of the so-called mineral elements in the nutrition and health of plants and animals but is not a critical or exhaustive survey of the literature. Written in an attractive style in popular phraseology it will be easily digested by agriculturists, veterinary surgeons and others interested in this intriguing subject but claiming no intimate knowledge of this specialised branch of chemistry.

There are 13 chapters each devoted to a different element: calcium, phosphorus, potassium, magnesium, sulphur, sodium, chlorine, iron, iodine, copper, manganese, cobalt and boron, while the following elements are grouped in one chapter: zinc, molybdenum, fluorine, silicon, selenium and nickel.

The elements are uniformly dealt with and each chapter is sub-divided into (i) the element in plant nutrition, and (ii) in animal nutrition. The first sub-division of each chapter is roughly divided into—the element: in soils ; in plants ; its deficiency, and correction of deficiency, while the second sub-division deals with the element: in animal foods; in the animal body; in animal products ; its deficiency and correction of deficiency ; and its excess.

There is an excellent bibliography of some 220 references. There are also three useful appendices—the first for the conversion of elements to certain compounds containing the element, the second listing the ash, calcium, phosphorus, chlorine and calcium phosphorus ratio of a wide variety of foodstuffs and the third the expression of mineral composition.

This is a most useful reference text-book of the "Aids to" type and should find a place in all agricultural and veterinary libraries. Since it will be frequently consulted it is unfortunate that the covers are of paper and the binding of poor quality. The reviewed copy already is showing signs of wear.

Questions and Answers

The submission of questions for inclusion in this column will be welcomed: they can relate to any aspect of veterinary work. For purposes of record, each question is numbered, and those submitting questions are required to furnish (not for publication) name and address.

Answers to readers' queries represent exclusively the personal opinions of the writers, and criticism of the replies will be appreciated.

All communications should be addressed to the Editor.

Extraction of Wolf Teeth from Thoroughbred Horses

Q. CCLXI.—*What is the best method of extracting wolf teeth from thoroughbred horses ? Is there any direct evidence that these teeth cause unthriftiness ?*

A.—The respondent, in his time, has extracted a good many wolf teeth, *i.e.*, supernumerary molars, in racehorses, and has never found that there was any great difference in method no matter what breed of horse was concerned. One may or may not need restraint or anaesthesia, depending upon size of tooth and temperament of animal. A special pair of wolf teeth forceps, or a large pair of dog molar forceps are required. The secret of ease in extracting is to get a firm grip, then rotate the tooth outwards to crack the outer alveolar wall. When this is done they almost fall out. Direct pulling may succeed but one needs considerable strength in many cases and the ultimate damage to the alveolus is greater than with the previous method.

As with extraction of any tooth the operator who fails often makes the job very easy for the "expert" who comes afterwards. No. 1 breaks down alveolar adhesions and No. 2 just puts forceps on the tooth and extracts it with the greatest of ease, thus gaining a renown which is not always deserved.

The respondent has known many cases in which removal of wolf teeth was followed by improvement in condition. There is no doubt that in certain cases they do interfere with proper mastication of food. Wolf teeth are much more important, however, with reference to bit control and many horses do not go well until they are removed.

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Pregnancy Diagnosis in Domestic Animals

Q. CCLXII.—*Can you describe a reliable method of pregnancy diagnosis in the goat ? Is the urine or blood test reliable and what is the earliest date it can be applied ?*

A.—The chief laboratory methods used for the diagnosis of

pregnancy in the human female and in the mare are based on the detection of increased amounts of either (i) gonadotrophic hormone in the urine (women) or in the blood (mare), or (ii) oestrogen in the urine (mare). These increases of gonadotrophic and oestrogenic hormones during pregnancy almost certainly have a placental origin in the two species indicated, although there is still considerable doubt about the exact sites and tissues at, or by, which they are secreted.

(i) *Gonadotrophic Hormone.*—It seems to be widely accepted that it is only in primates and equides that the placenta produces any gonadotrophic hormone. At all events there is no evidence that the placenta of animals other than those belonging to the two natural orders mentioned secretes this hormone in detectable amounts. The inference is, therefore, that a diagnostic test for pregnancy based on the quantitative determination of gonadotrophic hormone is possible only in man, monkeys and apes on the one hand and in the horse tribe on the other.

(ii) *Urinary Oestrogen.*—Considerable amounts of oestrogen are excreted in the urine of most animal species at some period of pregnancy. Thus, in the cow, and presumably also in the goat, large quantities are excreted during the *later* stages of pregnancy, although little is present in the urine in the *early* stages of gestation, *i.e.*, at just that time when a diagnostic pregnancy test based on urinary hormone level would have its greatest value supposing the hormone were present in the urine in readily detectable amount and form. Unfortunately, the small amount of oestrogen present in the urine of domestic animals, *the mare excepted*, during early pregnancy precludes the feasibility of any easily performed test for pregnancy based on the determination of this hormone. Moreover, almost all the oestrogen (oestriol) present in the urine of mammals other than the mare during pregnancy is conjugated with glycuronic acid, and in this form it is relatively inactive when assayed by the standard techniques in ovariectomised mice or rats. Therefore, with urine or any other material which contains only small concentrations of active oestrogen, rather delicate methods must be adopted for detection of the hormone and these are not suitable for use in a routine test. The presence of natural oestrogens in urine may also be determined by colorometric methods, but with these the oestrogen (oestriol) must first be split off from the glycuronic acid by bacterial action (*Bact. coli*). The procedure involved is again altogether too elaborate for its employment in a routine diagnostic test.

The answer to the problem posed by the inquirer may be summarised, therefore, by stating that there is no biological or chemical test for the determination of gonadotrophic or oestrogenic hormones in the urine or blood which is capable of application for the routine diagnosis of pregnancy in the goat, or indeed for any of the domestic animals with the unique exception of the mare.

Finally, the opportunity is here taken to note a forthcoming publication of the Commonwealth Agricultural Bureaux: "Pregnancy Diagnosis Tests: A Review," by A. T. Cowie, B.Sc., M.R.C.V.S., to be published sometime during 1948.

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Diarrhoea Associated with Distemper in Greyhounds

Q. CCLXIII.—*In a recent article Mr. K. J. Biddis states that he has found pthalylsulphiazole useless in the treatment of diarrhoea associated with distemper in greyhounds. What treatment do you advise for diarrhoea associated with distemper in these animals?*

A.—(1) The writer considers that diarrhoea in distemper is not of itself dangerous and must occur in all distemper cases. In so far as it will tend to disappear as recovery is taking place it is an excellent indication of progress. Particular attention should be paid to diet. No coarse meats of any sort should be fed whether raw or cooked and roughage should be avoided. No medicinal attempt need be made to check the condition. It is not in the patient's interests that he should be nauseated and disturbed by frequent and futile attempts to do so. If diarrhoea persists in the recovering dog it is almost invariably because of anal irritation due to tenderness (which should be treated with a suitable ointment) or to distended anal glands which should be emptied.

(2) In numerous cases, the diarrhoea is so prolonged, profuse and exhausting as to add greatly to the debility and loss of condition already present. In such instances benefit rather than harm must inevitably follow the administration of mild astringents, *e.g.*, prepared chalk, bismuth, kaolin, charcoal, etc.

If stools are slimy, bismuth is needed; if acid, lime water or sodae. bic.; if watery, opium. Hydrated aluminium silicate (kaolin) is of especial value as it is unaffected by the gastric juice and has the ability to absorb toxins from the alimentary canal, and to remove colloidal poisons and the debris of putrefaction.

Of the sulpha drugs, that which has appeared to the writer of this second answer as most efficacious is sulphamezathine.

NEW INSTRUMENTS AND APPLIANCES

A Pneumatic Cannula and Bung for Rumen Fistulae in Cattle

C. C. BALCH and V. W. JOHNSON

The National Institute for Research in Dairying, University of Reading

A new type of cannula for rumen fistulae in cattle has been developed at this Institute. It has been designed to cause the animal as little inconvenience as possible and for this reason is constructed entirely of rubber. When in position, and closed by a special bung, the entire appliance is highly flexible and very light, weighing only 1·3 lb. (0·6 Kg.). In addition, it provides no impediment to the arm during manipulations within the rumen and reticulum and provides an efficient means of sealing the fistula.

This device has been found to be more suitable than the heavy metal plug described by Watts (1948) and closes the opening more efficiently than packs of the type used by Schalk & Amadon (1928).

Construction

The appliance described and illustrated is suitable for closing a five-inch fistula. Apart from the valves it is constructed of solid sheet rubber or sheet rubber with canvas insertion.

(i) *The Cannula.*—This consists of two circular flanges from which oval holes, corresponding to the shape of the fistula, have been cut. The flanges are joined by a wall connecting the edges of the two ovals. The inner flange is 11 in. (28 cm.) in diameter and the outer flange 8 in. (20·5 cm.). The oval is 4¾ in. (12 cm.) by 3⅜ in. (8·7 cm.) and the wall is 1½ in. (3·8 cm.) in depth. The rigidity necessary to maintain the cannula in place is obtained by inflating rubber tubes in the outer circumferences of the two flanges. Inflation of these tubes is by means of a bicycle pump and takes place after the device is in position. A ring of rubber insertion of 8 in. (20·5 cm.) outer diameter and 4½ in. (11·5 cm.) inner diameter is joined to the tube of the small flange by its outer border thus forming a flap which neatly encloses the bung. Eyelet holes in this flap can be laced together to give additional support to the bung.

Details of the types of rubber used in the construction of the cannula and further measurements are given in Fig. I while Fig. II shows the complete device with the bung. Fig. III shows the cannula in position.

(ii) *The Bung.*—The bung is an oval-shaped rubber bag which can be inflated in the same way as the cannula tubes. The inner surface is an oval of stiff insertion larger than the cannula opening and from this walls of pliable rubber run outward to be joined in a smaller oval to a stiff insertion disc 6¼ in. (16 cm.) in diameter. There is therefore a marked taper on the side walls of the bung serving to keep it in position. The walls are 2½ in. (6·5 cm.) broad. Inflation tends to expand the side walls rather than the stiff inner and outer surfaces and to accentuate this effect, these surfaces are joined by strips of canvas which prevent expansion in an inward direction. Some bungs have also been constructed with a sleeve leading through for the passage of a recording tube.

Details of the construction of the bung are given in Fig. I while the general shape can be seen in Fig. II.

When the cannula is to be closed the deflated bung is placed in position, care being taken to see that the inner surface has passed completely through, and the rim of the outer disc (A) is slipped under the flap of the cannula. After inflation the complete device appears as in Fig. IV except that the eyelet holes may be loosely laced across if necessary. For the proper working of the apparatus only moderate inflation of tubes and bung is required.

This apparatus is being used during studies in ruminant nutrition in fistulae established by Dr. A. T. Cowie.

We are grateful for the care and patient interest taken by Mr. E. Anderson and those members of the Avon India Rubber Company, Melksham, Wiltshire, who were responsible for the construction of the appliance.

References

Schalk, A. F., & Amadon, R. S. (1928.) *N. Dak. Agric. Exp. Sta. Bull.* 216.

Watts, P. S. (1948.) *Vet. Rec.* 60. 4.

CANNULA FOR RUMEN FISTULAE

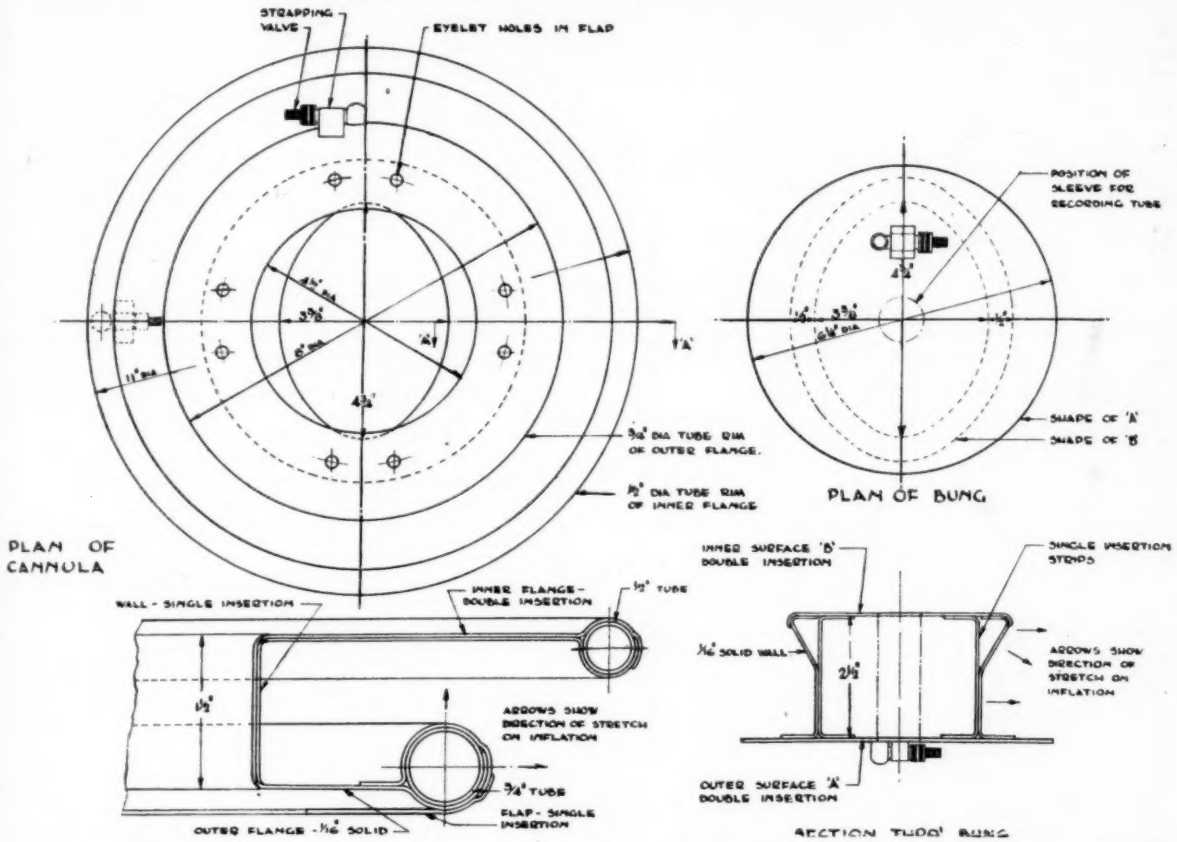
STRAPPING VALVE
EYELET HOLES IN FLAP
POSITION OF SLEEVE FOR RECORDING TUBE
SHAPE OF 'A'
SHAPE OF 'B'
PLAN OF BUNG
PLAN OF CANNULA
WALL - SINGLE INSERTION
INNER FLANGE - DOUBLE INSERTION
ARROWS SHOW DIRECTION OF STRETCH ON INFLATION
FLAP - SINGLE INSERTION
OUTER FLANGE
SCRAP SECTION 'AA' (ENLARGED)
INNER SURFACE 'B' DOUBLE INSERTION
SINGLE INSERTION STEMS
ARROWS SHOW DIRECTION OF STRETCH ON INFLATION
OUTER SURFACE 'A' DOUBLE INSERTION
SECTION THRO' BUNG

Fig. I.—Working drawing of Cannula (i) and Bung (ii)

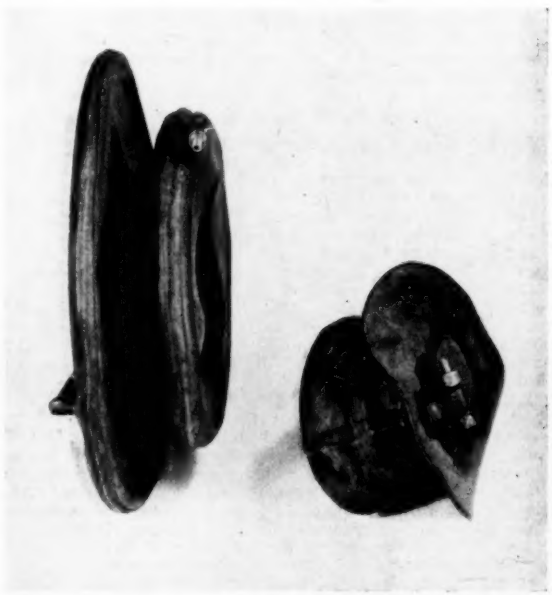

Fig. II.—The Cannula (i) and Bung (ii)

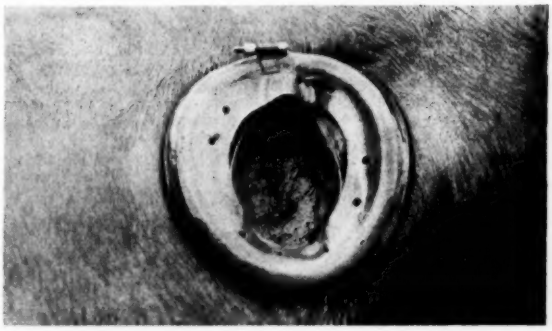

Fig. III.—The Cannula in position showing rumen contents

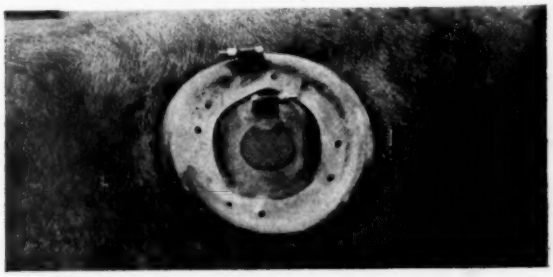

Fig. IV.—The complete device in position

NOTES AND NEWS

Diary of Events

Sept. 11th.—13th Annual Meeting and Dinner of the Royal (Dick) Veterinary College, Alumnus Association at Southport (Prince of Wales Hotel), 7.30 p.m.

Sept. 14th.—Meeting of Society of Veterinary Practitioners, in the Assembly Room, Cambridge Hall, Southport, 2.30 p.m.

Sept. 14th.—Annual General Meeting of the Association of Veterinary Teachers and Research Workers, in the Council Chamber, Town Hall, Southport, 3 p.m.

Sept. 17th.—Meeting of the Derbyshire Division, N.V.M.A., at Sutton Bonington, 2.15 p.m.

Sept. 18th.—Meeting of the North of Ireland Division, N.V.M.A., at Belfast (Ulster Farmers' Union Hall), 7.15 p.m.

Sept. 18th.—Annual meeting of the North of Scotland Division, N.V.M.A., at Bucksburn (Veterinary Laboratories, Mill of Craibstone), 2 p.m.

Sept. 23rd.—Special General Meeting of the South-Eastern Division, N.V.M.A., at Maidstone (Royal Star Hotel), 6 p.m.

Sept. 23rd.—Meeting of the North Wales Division, N.V.M.A., at Dolgelley (Golden Lion Hotel), 2 p.m.

Sept. 24th.—Meeting of the South Wales Division, N.V.M.A., at Carmarthen (St. Peter's Church Hall), 2 p.m.

Sept. 24th.—Meeting of the Biochemical Society in the Department of Biochemistry, The University, Sheffield, 11.30 a.m.

Sept. 29th, 30th, Oct. 1st.—R.C.V.S. Committee and Council meetings, 10, Red Lion Square, W.C.1.

Oct. 6th.—Meeting of the Editorial Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 2.30 p.m.

Oct. 7th.—Meeting of the Central Veterinary Society at the Royal Veterinary College, 2 p.m.

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WITNESSES ALLOWANCES REGULATIONS, 1948

Veterinary Surgeons on "Professional Witness" Scale

Following upon representations made by the Royal College and the National Veterinary Medical Association, that, *inter alia*, members of the veterinary profession should be included in the list of those eligible for the grant of allowances as professional witnesses in indictable cases, when the Witnesses Allowances Order was revised, the Departmental Committee considering the revision of its provisions agreed to recommend to the Home Office accordingly.

In the Witnesses Allowances Regulations, 1948, issued by the Stationery Office last week, veterinary surgeons—and dentists—have been added to the classes of persons to whom professional witness allowances may be paid. They may receive a maximum of £5 a day, or £2 10s. if they are away from the place where they live or practise for not more than four hours. Provision is also made for the payment of night allowances.

The Regulations also provide that there may be allowed to an expert witness for attending to give expert evidence and, where necessary, for qualifying to give that evidence—

(*a*) an expert witness allowance of such amount as the court may consider reasonable having regard to the nature and difficulty of the case and the work necessarily involved;

(*b*) a night allowance.

* * * * *

PERSONAL

Appointments.—The Colonial Office announces the appointment of Dr. Harvey S. Purchase, B.SC., PH.D., F.R.C.V.S., Senior Veterinary Research Officer, as Chief Veterinary Research Officer, Kenya.

Major R. Clarke Glover, V.D., M.R.C.V.S., has been appointed Veterinary Officer, Department of Agriculture, Jamaica. The address of the Department is Montego Bay, Jamaica, B.W.I.

* * * * *

Births.—BARNETT.—On May 25th, 1948, at the Maia Carberry Nursing Home, Nairobi, Kenya, to Barbara, wife of Dr. S. F. Barnett—twin son and daughter.

BOUNDY.—On September 4th, 1948, to Catherine (*née* Mather), wife of T. Boundy, B.V.SC., M.R.C.V.S., Montgomery, N. Wales—a son.

BRYSON.—On August 31st, 1948, at St. Christopher's Nursing Home, Chatham, to Honor, wife of Robert W. Bryson, M.R.C.V.S., of 91, Copenhagen Road, Gillingham—a daughter, Sally.

DINGLE.—On Sunday, August 29th, 1948, at Ardencaple Nursing Home, Nunthorpe, Yorks, to Janie Murray (*née* Imrie), wife of P. J. Dingle, M.R.C.V.S.—a daughter, Frances Mary.

MACKENZIE.—At the Cottage Hospital, Turriff, Aberdeenshire, to Alexena, wife of George J. Mackenzie, M.R.C.V.S., Panton House, Turriff—a daughter.

* * * * *

Marriage.—STEELE-BODGER—FINLAYSON.—On September 4th, 1948, at Burley Parish Church, Alasdair, elder son of Mr. and Mrs. H. W. Steele-Bodger, of Tamworth, Staffordshire, to Anne, daughter of Capt. and Mrs. A. W. J. Finlayson, of Berry Knoll, Burley, Hants.

* * * * *

Knights of the Round Table.—At a Council meeting of the Knights of the Round Table, the Earl of Athlone, the Knight President, in the chair, Dr. W. M. Scott, F.R.C.V.S., Bridgwater, was elected Knight Constable and Master of the Horse.

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Degree.—Mr. Brendan T. Farrelly, M.SC., M.R.C.V.S., has had conferred on him, recently, the Degree of Doctor of Veterinary Medicine, in the Faculty of Veterinary Medicine, of the University of Berne.

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Capt. T. L. Wright's Progress.—We are glad to record that Capt. Thomas L. Wright's prolonged stay in St. George's Hospital following his accident in July terminated last week-end, the fractured right tibia having been successfully plated on August 12th.

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R.C.V.S. OBITUARY

BESANT, John Bernard, 36, Innishmaan Road, Whitehall, Dublin. Graduated Dublin, July 3rd, 1947. Died August, 1948; aged 29 years.

CATTELL, Arthur John, Bishop House, Brecon. Graduated London, May 19th, 1892. Died in the Breconshire War Memorial Hospital, September 1st, 1948.

HAYHURST, James Rogerson, 40, Temple Fortune Lane, London, N.W.11. Graduated Liverpool, December 18th, 1906. Died September 3rd, 1948.

WEBSTER, George Charles, M.R.C.V.S., D.V.S.M., Capt. late S.A.V.C., of 11, King Street, Lancaster. Graduated Edinburgh, December 15th, 1908. Died at Mataffin, East Transvaal, South Africa, August 26th, 1948.

MR. J. B. BESANT, M.R.C.V.S.

A Tribute

With John Besant's tragically premature death there is lost to the veterinary profession, and to the world, a type of man both can very ill afford to do without.

He had been qualified barely a year and showed an exceptional promise in veterinary practice. His brief assistantship with me more than testified to this. I have not seen any individual naturally gain so warm a corner in people's hearts within so short a time.

His academic career at Glasgow and at Dublin was distinguished and this in spite of the earlier discouragement and the great gaps which illness persistently made in his training.

Death comes home to us, perhaps, only when it touches those we know. But the loss of a good man is a loss to each one of us.

J. F. B.

Mr. James R. Hayhurst, M.R.C.V.S., D.V.S.M.

We record above with deep regret the death of Mr. James Rogerson Hayhurst, formerly Superintendent and Chief Veterinary Inspector of the Metropolitan Cattle Market, but two years after his retirement from his duties under the Corporation of London when he had completed nearly 34 years of valued service.

Mr. Hayhurst, who was a member of the N.V.M.A. of long standing, went to Islington in 1912 after five years with the Blackburn Corporation as Veterinary Surgeon and Superintendent of the Cattle Market; his tenure of office in N. London saw a great increase in the veterinary inspection work there and, under his guidance, material improvement in the premises. An admirable administrator, he had the complete confidence of the Cattle Markets Committee, as well as of the traders with whom he had to deal.

As recorded in our issue of July 20th, at the time of his retirement, Mr. Hayhurst acted for the late Colonel Dunlop Young during his absence at the period of the 1914-18 war and at other times, as Veterinary Inspector for the City of London under the Diseases of Animals Acts, embracing the administrative duties under the contagious Diseases of Animals Acts for the City and also for the Port of London in respect of imported animals. On Colonel Dunlop Young's return from the war Mr. Hayhurst retained a part of the duties and on the retirement of the former in 1934 he was appointed Chief Veterinary Inspector for the City, with first Mr. A. C. Lloyd and then Mr. E. F. McCleery, the present chief, as assistants.

Throughout his career in the metropolis Mr. Hayhurst was a keen and highly valued participant in the activities of the Royal Sanitary Institute. A member of the Board of Examiners for Inspectors of Meat and Other Foods, he was at one time Chairman of the Examination Committee. Always a prominent figure at the annual congress of the Institute, he was the recording secretary of the Veterinary Hygiene Section for 12 years and was honoured with the presidency for one year. His insistence that it is the duty of members of the profession to support the section, as representing a great opportunity to impart the "veterinary view" in public health work, is gratefully remembered now that the truth of this contention has gained acceptance, but the rather meagre response met with at the time was a source of disappointment to him. For some years Mr. Hayhurst was the sole representative of the veterinary profession on the Council of the Institute.

Widely recognised as an authority in his sphere of professional work, Mr. Hayhurst was popular as a lecturer and demonstrator. Under the terms of his appointment he gave much helpful tuition in this way to students of the Royal Veterinary College and to those undertaking the courses of the Royal Sanitary Institute, the Smithfield Institute, the Battersea Polytechnic, etc. Amongst his responsibilities was the well-known Caledonian Market, which grew to be the largest market of its kind in the world.

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THE ANIMAL HEALTH TRUST

Farm Livestock Research Appointment

Dr. W. R. Wooldridge, Scientific Director of the Animal Health Trust, announces the appointment of Dr. H. Williams Smith, M.Sc., M.R.C.V.S., Dip. Bact., to the staff of the Trust's Farm Livestock Research Station.

Dr. Williams Smith has been in receipt of a Wellcome Fellowship of the Trust for the last three years, and has conducted researches during this period upon staphylococcal infections of animals, paying particular attention to the typing of this group of bacteria by means of bacteriophage. He also carried out work in connection with staphylococcal mastitis of dairy cattle and certain staphylococcal infections of sheep.

Pending the establishment of laboratories at St. Ives, Hunts, Dr. Williams Smith will work at the Institute of Animal Pathology, University of Cambridge. He will, in the first instance, extend his researches to the brucella group of organisms which are responsible for contagious bovine abortion in cattle and undulant fever in man.

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Research Training Scholarships

The Trust also announces the award of the following Research Training Scholarships:

L. J. P. Duncan, B.Sc., M.R.C.V.S., of the Royal (Dick) Veterinary College, Edinburgh, and 40, Westholme Avenue, Aberdeen, in order to continue a medical course at the University of Edinburgh preparatory to taking an Honours degree in pathology.

K. J. Hill, M.R.C.V.S., of the University of Liverpool and 96, Norlands Lane, Widnes, Lancs., in order to undertake research into the normal physiology of the digestive tract in the ruminant. He is to study in the Physiology Department at the University of Liverpool. Mr. Hill is a Spillers Scholar of the Trust.

H. Platt, B.V.Sc., M.R.C.V.S., of the University of Liverpool and 8, Grenville Place, London, S.W.7, to take effect from October, 1948, in order to continue his researches in pathology, in particular in connection with tumours, at Guy's Hospital.

R. M. Roberts, M.R.C.V.S., of the Glasgow Veterinary College and 21, Crandleyhill Road, Prestwick, Ayrshire, the award of a Cooper Scholarship in order to take an Honours degree in zoology, with particular reference to parasitology, at the University of Edinburgh with the ultimate aim of specialising in veterinary parasitology.

D. Jenkins, M.R.C.V.S., of the Royal Veterinary College, London and 64, Highgate Road, Walsall, Staffs., to enable him to go to the University of Cambridge in October, 1949, to take Tripos in zoology, with the ultimate purpose of undertaking veterinary medicine.

A. C. Palmer, M.R.C.V.S., of the Royal Veterinary College, London and Swannington Hall, near Norwich, in order to go to the University of Cambridge in October, 1949, to study for a Tripos in physiology preparatory to specialising in experimental surgery.

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County Committees of the Animal Health Trust are now operating in Glamorgan, Cornwall, Berkshire, Somerset, Kent and Hampshire. In eight other counties, preliminary steps in forming committees are being taken.

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The recent B.B.C. appeal made by Dr. W. R. Wooldridge on behalf of the Animal Health Trust realised £580 15s. 5d.

AGRICULTURAL RESEARCH COUNCIL

The committee of the Privy Council for agricultural research has appointed Lord Rothschild to be Chairman of the Agricultural Research Council, in succession to Lord De La Warr. Lord Rothschild, a biologist, has carried out research work in the department of zoology at Cambridge, and has published many scientific papers.

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ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Sheep Scab:

Montgomery.—Cedig, Llanwddyn, Montgomeryshire (August 30th).

Montgomery.—Pen-y-bont, Carrog, Corwen, Merionethshire (August 31st).

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MILK RECORDING IN SCOTLAND

The Scottish Farmer reports that, speaking at the annual general meeting of members of the Scottish Milk Records Association in Glasgow, Mr. George Lambie, the new Chairman, expressed satisfaction that there was still a demand for milk recording, and referred to the arrangements being made for expansion in several directions during the next twelve months. Since the beginning of the year, he said, 14 new milk recording circuits had been brought into operation; and the number of herds now being officially Recorded as at August 31st had reached the total of 1945, an increase of 200 since the beginning of the year, and representing 20·7 per cent. of the dairy herds in Scotland. He could not give the exact number of cows which had been officially recorded and tested since the beginning of the year, but it was estimated to be approximately 25 per cent. of the dairy cow population. Arrangements were well in hand for the provision of new Societies in Islay, North Argyll and in Orkney; several additional Circuits would be in operation before the end of the year, and it was anticipated that by December 31st, over 2,000 herds would be under test. The supervisory staff, to which two new supervisors were appointed during the last year, is to be further increased and the Association would very much like to have a still greater increase in membership.

The report continues: "Although Scotland compares very favourably with England in the matter of milk recording, only about one dairy herd in five is milk recorded (in England the figure is one in eight) and a very slightly higher proportion of the milk cows. Efficient dairy farming requires milk recording, and milk producers should give heed to the remarks made by the retiring President, Mr. George Templeton. The Scottish milk producers, he said, 'cannot continue to hold their own in the economic production of milk so long as they continue groping along in the dark.'"

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COMMONWEALTH SCIENTIFIC LIAISON

The Colonial Office publication *Commonwealth Survey*, announcing the appointment of the first scientific liaison officer to represent any colonial territories in the United Kingdom (Mr. R. McChlery, representing the Central African Council) takes the opportunity to review the development of "Commonwealth scientific liaison." as follows:—

"Before World War II, there was no central Commonwealth organisation for promoting collaborative scientific work, by means of which scientists could exchange ideas, tackle problems together and keep constant contact with experts in their own countries. During the war, however, the necessity for setting up such an institution became imperative, and the British Central Scientific Office was set up in Washington in 1941, and by 1944 developed into the British Commonwealth Scientific Office (B.C.S.O.), Washington. The B.C.S.O. Washington not only made contact between Commonwealth scientists readily available, but also made possible a close relationship with the United States Government and United States scientific research institutions and technical bureaux.

"The British Commonwealth Scientific Official Conference, convened by His Majesty's Government in the United Kingdom together with other Governments of the Commonwealth, was held in 1946 and reaffirmed, what had already become clear, that within the Commonwealth the scientific problems of peace were no less pressing than those of war, and that Commonwealth scientists were most anxious to continue collaboration. Mr. Herbert Morrison who, as Lord President of the Council, is Minister responsible for the United Kingdom Department of Scientific and Industrial Research, opened the Conference and pointed out that the United Kingdom Government was most concerned that science should

be applied to improving the standard of life throughout the Commonwealth. Mr. Morrison stated, however, that there would be an acute shortage of manpower in the Commonwealth for some years to come, and that co-operation on certain scientific subjects, such as the study of the upper atmosphere and its effect on the travel of radio waves and the study of cosmic rays, appeared to be necessary.

"In 1946 there were two types of Commonwealth scientific liaison; there was the system in London where the liaison officers worked separately almost as part of the administrative machinery of the High Commissioners' Offices, and the alternative arrangement in Washington where the liaison officers worked together in one building. The Conference recommended that London needed an organisation similar to the one in Washington, and that 'a centre should be established by housing the several scientific liaison offices of the various parts of the Commonwealth, including suitable United Kingdom representation, under one roof.' Other suggestions put forward for the London centre included recommendations that each office should retain complete liberty of action in the conduct of its affairs; there should be a sharing of common services, which might include a reproductive service, photographic, microfilming and photostat services and a stenographic pool to supplement the secretariat of the individual offices; and that each office should be financed by the particular government concerned.

"Following on the recommendations of the Conference, the British Commonwealth of Nations Scientific Liaison Offices (B.C.S.O.), London, were opened in April of this year in Africa House, where all Commonwealth Scientific Liaison Offices now have their headquarters. The offices which have agreed to take part in the scheme are the scientific liaison offices of Australia, Canada, Central African Council, India, New Zealand, South Africa and the United Kingdom. Representatives of Pakistan and the Commonwealth Agricultural Bureaux attend meetings at the headquarters, and the Overseas Liaison Division of the United Kingdom Department of Scientific and Industrial Research is now also working in Africa House.

"The 1946 Commonwealth Scientific Official Conference, in making its proposals regarding the functions of any permanent machinery to ensure Commonwealth scientific co-operation in London, recommended that the British Commonwealth Scientific Office, Washington, should be used as a model. This recommendation has been adopted and the functions of the Washington Office, which is still operating, have been modified to suit the Offices in London. The functions of the B.C.S.O., Washington, are shown in the Report of Proceedings of the Conference as follows:

(1) To assist official scientific visitors from the home countries.

(2) To maintain close personal contact with the U.S. Government and other research institutions and technical bureaux.

(3) To obtain prompt and comprehensive answers to questions asked by Government departments in the home countries.

(4) To stimulate and maintain the exchange of official scientific and technical reports, and to pass inward reports to the appropriate U.S. recipient.

(5) To report new developments and changes in policy and organisation on scientific matters in the U.S.

(6) To facilitate supply, within certain limits, of books, chemicals, scientific apparatus and biological materials for official scientists in the home countries.

(7) To advise agencies of the Commonwealth countries in the United States on Service, Industrial and other aspects of Science."

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MINISTRY OF AGRICULTURE NEWS SERVICE

What Lime Means to Cows.—Unless limed, herbage and milk will lack lime and solids-not-fat content fall below legal standard, especially where herbage also lacks crude protein.

A few years back several hundred varied samples of West of England hay were examined. Sixty out of every 100 had less than 1·07 per cent. lime (as CaO) and 63 less than 10 per cent. crude protein in the dry matter—the lowest percentages for satisfying the basic requirements for the dairy cow's maintenance. So it is not surprising that the chemical quality of milk (measured by the percentage of non-fatty solids) is deteriorating, the most critical time being early spring. War-time feeding—less concentrates and more bulky fodder—aggravated the problem.

Every year 20 milking cows remove from the land 300 lb. of lime through their milk and their 20 calves at time of birth; every ton of hay sold off takes 20 lb. Small wonder that before the war and the Land Fertility Scheme, many of our "flogged" dairy pastures badly needed lime, for farmers had to sell everything off the farm and could not afford to make good the lime or, for that matter, the phosphates sold off in the milk and hay.

The lime needed by the cow for all purposes greatly exceeds the bare amount returned in her milk. A 700-gallon cow needs 100 lb. yearly. If the grass and hay she eats in a year contain 1 per cent. of lime in the dry matter, she will get from it 86 lb. of lime. Of the hay analysed about half the samples contained less than 0·95 per cent. lime in the dry matter—one in ten below 0·65 per cent. This spells lime deficiency—and poor quality milk.

Nitrogenous fertilisers—essential for full output—lower the lime intake of herbage, particularly if the soil's lime content is low. Drought lowers it, too.

Lime applied to acid land increases the lime content of herbage and fodder crops. New leys and seeds hay contain much more than permanent grass—all our samples contained over 1 per cent. lime, some reaching even 2·5 per cent. A simple free soil test by the Agricultural Executive Committee will show whether lime is needed or not.

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Winter Milk to See Us Through.—Milk has been plentiful this summer, but there is still anxiety about winter supplies. Have farmers turned from winter to summer production owing to shortage of labour and feeding-stuffs and the competitive demands of cash crops for direct human consumption? Some tendency in that direction there may have been—probably more by accident than design. It is difficult without complete herd replacements to change seasonal calvings suddenly. To ensure winter milk supplies heifers are required to calve in the autumn. This means winter breeding, when heifers, unless they are well fed, sometimes fail to come into oestrum.

Although the public is now getting more milk, there has been some decline in yield per cow—a tendency more pronounced with the big herds. The increased demand for milk has been met by the influx of a large number of small milk producers. Through intensified cropping many farmers with limited acreage have successfully maintained, or even increased, their winter output. But the production of special crops for winter feeding can generally be achieved with less effort by the farmer with greater scope and the requisite tackle. All dairy farmers must aim, as far as possible, at a regular output the year round; but the man with most acres must pay most attention to winter milk. He naturally and rightly has been giving increased attention to such crops as wheat and potatoes, and so has found some difficulty in meeting the summer labour requirements of milk and arable combined. On the other hand, pressure out of doors relaxes in winter, and the dairy herd helps to maintain a more regular balance of labour throughout the year.

On a large farm it is relatively simple to provide the hay, straw, silage, roots, kale and grain that must form the basis, if not the entire fabric, of feeding to-day. Accommodation and water supplies will usually present fewer difficulties than on the smaller farms—formerly all-grass. It is generally impossible for long to maintain arable farming—to grow wheat, beet and potatoes—without adequate supplies of dung. The cow and the stackyard are the means to this end.

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The Australian R.S.P.C.A. is (says the *Farmer and Stock-Breeder*) offering a reward of £A1,000 for a preventative that will render sheep immune from blowfly attacks, adding that a study of the history of flystrike has encouraged the belief that immunisation of sheep will be found either in a vaccine or in some ingredient lacking in diet.

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In Beverley Hills, California, a butcher has evidently decided that meat has been in the luxury class long enough to qualify for permanency. He has spent £2,500 to make his shop window resemble an expensive jeweller's, and he displays choice cuts on velvet pillows, hoping that the window shopper will be tempted to buy a Sunday joint of beef costing £4 or £5.—*Economist.*

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Weekly Wisdom

". . . *What a proof is here offered that the only wise and safe course is to act from day to day in accordance with what one's own conscience seems to decree . . .*"—Mr. Winston Churchill, *War Memoir's*, Vol. 1 (referring to the changed attitude towards his utterances in the House of Commons after his accession to the Premiership).